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The book is divided into thirteen chapters. The first of these is devoted to a brief exposition of auxiliary theories relating mainly to systems of differential equations. In chapters II to XI inclusive there is given a very clear exposition of the fundamental concepts of continuous groups, exclusive of the important theory of contact transformations. The last two chapters are devoted to applications. In the former of these, Chapter XII, the author gives the fundamental concepts relating to the applications of the theory of continuous groups in the theory of differential equations. The final chapter is devoted to geometric applications and bears the heading "*Applicazioni alla teoria degli spazi pluridimensionali con gruppi continui di movimenti.*"

Although the present work is considerably more concise than the *Vorlesungen über Continuierliche Gruppen*, 1893, by Lie-Scheffers it is almost equally elementary and leads the student much more rapidly to the fundamental theorems of the subject. The book is unusually free from errors and constitutes a decidedly useful aid for acquiring quickly an insight into the abstract theory of finite continuous groups. While the founder of the theory of continuous groups was a Norwegian he published most of his extensive systematic developments in the German language, and the present work will be especially welcomed by those who desire to acquire a knowledge of this field but do not read German comfortably.

G. A. MILLER.

An Introductory Treatise on Dynamical Astronomy. By H. C. PLUMMER. Cambridge: at the University Press, 1918. Royal 8vo. 19 + 343 pp. Price 18 shillings.

Contents—Chapter I: The law of gravitation, 1–10; II: Introductory propositions, 11–20; III: Motion under a central attraction, 21–32; IV: Expansions in elliptic motion, 33–48; V: Relations between two or more positions in an orbit and the time, 49–64; VI: The orbit in space, 65–72; VII: Conditions for the determination of an elliptic orbit, 73–84; VIII: Determination of an orbit, Method of Gauss, 85–93; IX: Determination of parabolic and circular orbits, 94–102; X: Orbits of double stars, 103–114; XI: Orbits of spectroscopic binaries, 115–128; XII: Dynamical principles, 129–141; XIII: Variation of elements, 142–157; XIV: The disturbing function, 158–176; XV: Absolute perturbations, 177–191; XVI: Secular perturbations, 192–206; XVII: Secular inequalities, Method of Gauss, 207–217; XVIII: Special perturbations, 218–235; XIX: The restricted problem of three bodies, 236–253; XX–XXI: Lunar theory, 254–291; XXII: Precession, nutation and time, 292–311; XXIII: Libration of the moon, 312–322; XXIV: Formulæ of numerical calculation, 323–340; Index, 341–343.

Quotations from the preface: "This book is intended to provide an introduction to those parts of Astronomy which require dynamical treatment. To cover the whole of this wide subject, even in a preliminary way, within the limits of a single volume of moderate size would be manifestly impossible. Thus the treatment of bodies of definite shape and of deformable bodies is entirely excluded, and hence no reference will be found to problems of geodesy or the many aspects of tidal theory. Already the study of stellar motions is bringing the methods of statistical mechanics into use for astronomical purposes, but this development is both too recent and too distinct in its subject-matter to find a place here. . . . Since the main object in view has been to cover a wide extent of ground in a tolerably adequate way rather than to delay over critical details, the absence of mathematical rigour may sometimes be noticed. Very little attention is given to such questions as the convergence of series. It is not to be inferred that these points are unimportant or that the modern astronomer can afford to disregard them. But apart from a few simple cases where the reader will either be able to supply what is necessary for himself, or would not benefit even if a critical discussion were added, such questions are extremely

difficult and have not always found a solution as yet. It is precisely one of the aims of this book to increase the number of those who can appreciate this side of the subject and will contribute to its elucidation."

Mr. Plummer is professor of astronomy in the University of Dublin and Royal Astronomer of Ireland.

Handbook of Mathematics for Engineers. By E. V. HUNTINGTON. With Tables of Weights and Measures by L. A. FISCHER. New York, McGraw-Hill, 1918. 12mo. 5 + 191 pp. Price \$1.50.

This volume is a reprint of sections 1 and 2 of the *Mechanical Engineers' Handbook* edited by L. S. Marks (1916). Mr. Fischer's tables occupy pages 70-85. The rest of the work is by Professor Huntington.

The "mathematical tables" (pages 2-69) are: squares of numbers, cubes of numbers, square roots of numbers, cube roots of numbers, three-halves powers of numbers, reciprocals of numbers, circles (areas, segments, etc.), spheres (volumes, segments, etc.), regular polygons, binomial coefficients, common logarithms, degrees and radians, trigonometric functions, exponentials, hyperbolic (Napierian) logarithms, hyperbolic functions, multiples of 0.4343 and 2.3026, residuals and probable errors, compound interest and annuities, and decimal equivalents.

The contents of the rest of the work are as follows: Arithmetic (Numerical computation, logarithms, the slide rule, computing machines, financial arithmetic), 88-98; Geometry and Mensuration (Geometrical theorems, geometrical constructions, lengths and areas of plane figures, surfaces and volumes of solids), 99-111; Algebra (Formal algebra, solution of equations in one unknown quantity, solution of simultaneous equations, determinants, imaginary or complex quantities), 112-127; Trigonometry (Formal trigonometry, solution of plane triangles, solution of spherical triangles, hyperbolic functions), 128-135; Analytic Geometry (The point and the straight line, the circle, the parabola, the ellipse, the hyperbola, the catenary, other useful curves), 136-156; Differential and Integral Calculus (Derivatives and differentials, maxima and minima, expansion in series, indeterminate forms, curvature, table of indefinite integrals, definite integrals, differential equations), 157-172; Graphical representation of functions (Equations involving two variables, equations involving three variables, equations involving four variables), 173-184; Vector Analysis, 185-186; Index, 187-191.

The volume contains a great amount of useful and interesting information admirably edited.

The American Society of Mechanical Engineers, New York. *The Weights and Measures of Latin America*¹ by F. A. HALSEY. New York, 1918. 8vo. 34 pp.

This is a report based on the replies received after distributing five hundred copies of a questionnaire throughout South and Central America and the West Indies. Four of the six questions of the questionnaire were as follows:

1. What are the units of weight and measure commonly used with relation to the buying and selling at retail of the following products?—Groceries, fruits, milk, butter and cheese, other farm products, hardware, fish, meat, flour, tea and coffee, dry goods, fuel, tobacco, miscellaneous.

2. What are the units of measure commonly used with relation to buying and selling articles of clothing, as follows?—Ready made clothing, hats, collars, underwear and hosiery, shoes, gloves, corsets, miscellaneous.

3. What are the units of measure commonly used with relation to the sale of lands and filing of paper and deeds as follows?—In the farming districts, in the smaller towns, in the cities.

6. What are the units of weight and measure commonly used with relation to transportation tariffs?—Railway tariff for passengers and freight (load and distance), loads and rates for city transportation, loads and rates for transportation by muleback across the mountains, railway track gages and length of lines, railway equipment (units used in the construction and repairing of locomotives, cars, etc.).

¹ Paper presented at the annual meeting of The American Society of Mechanical Engineers, December, 1918.